

should be able to take a photograph of the eclipse, in the third order, in two minutes. Similarly, we may hope for a photograph of the second order in two minutes, and it is, I think, highly probable also that a photograph of the first order may be obtained in one minute. To make assurance doubly sure, the whole of the totality may be used during the coming eclipse, but if there be several such attempts made it will certainly be worth while to try what a shorter exposure will do.

Now, by mounting photographic plates on both sides of the axis, one solidly mounted equatorial of short focal length may enable us to obtain several such photographs, with varying lengths of exposure. I insist upon the solidity of the mounting because, if any one plate is to be exposed during the whole of totality, the instrument must not be violently disturbed or shaken while the eclipse is going on. I think, however, it is quite possible to obtain more than one photograph of the lower order spectra without any such disturbance in this way. The same plate may be made to record three, or even four, exposures in the case of the first order in an eclipse of four minutes' duration, by merely raising or lowering it after a given time, by means of a rapid screw or other equivalent contrivance, so that a fresh portion of the same plate may be exposed. Similarly, the plates on which the spectra of the second order are to be recorded may be made to perform double duty.

If one equatorial thus mounted were to be devoted to each quadrant of the coronal atmosphere, it is certain, I think, that most important results would be obtained.

J. NORMAN LOCKYER

(To be continued.)

GIGANTIC LAND-TORTOISES

Gigantic Land-Tortoises, Living and Extinct, in the Collection of the British Museum. By A. C. L. G. Günther, M.A., M.D., F.R.S. Keeper of the Department of Zoology. (London: Printed by Order of the Trustees, 1877.)

THE recent and extinct gigantic land-tortoises in the collection of the British Museum has just received at the hands of Mr. A. C. L. G. Günther, Keeper of the Department of Zoology, an elaborate and exhaustive memoir and history. As early as 1872 Dr. Günther had made much progress in the elucidation of their structure, but in 1874 the osteology of the Mascarene tortoises had still more engaged his attention. Again in 1877 new matter arising from fresh materials imported into England from the Aldabra group of islands, Mauritius, Rodriguez, and the Albemarle and Abingdon Islands, enabled Günther to complete his memoir upon these gigantic land-tortoises, recent and fossil.

This important volume contains a description of the races of the Aldabra group, the extinct races of the Mascarene group (Mauritius and Rodriguez), and lastly, the Galapagos Islands races. Dr. Günther, at p. 10, gives a synopsis of the fossil and living gigantic land-tortoises. He bases his classification upon the presence or absence of the nuchal plate—frontal portion of the skull—condition of the pelvis as to nature of the symphyseal bridge, and whether the gular plate is single or double. The Aldabra tortoises, or those of the Aldabra Islands,

fall under the first group, or those with the nuchal plate present, gular plate double, and frontal portion of skull convex and with the pelvis having a narrow symphyseal bridge. Four species of *Testudo*, all living, occur in the Aldabra group.

The second group, embracing the Mascarene and Galapagos tortoises, possess no nuchal plate; the symphyseal bridge is broad, and the frontal portion of the skull is flat. The Mascarene species, four in number, are all extinct, and are found by Günther to have a single gular plate and short sternum, whereas the Galapagos tortoises have a double gular plate and rather large sternum, and all but one species (*Testudo ephippium*), from Indefatigable Island, are living.

These deductions arrived at by Dr. Günther after years of long and patient labour, greatly add to our knowledge of the structure of the Testudinæ greatly removed in space; he not only shows that the Aldabra species have definite and almost individualised structure, but that they are entirely different species from their nearest or Mascarene neighbours, a great fact in the distribution of life, over an area once continuous land, but now known to be one of depression, and yet geographically contiguous, the Island of Madagascar only separating them. Here, however, we have not a wide distribution in space, and yet no species seems common to the Mascarene and Aldabra Testudinæ—the living races of the Aldabra group being entirely different from the extinct races of the Mascarenes. Dr. Günther endeavours to show that in the absence of direct genetic relationship between the tortoises of the Galapagos Islands and the Mascarenes, that some "terrestrial tortoises" were transported through some agency ("stream or current") from the American continent to the Galapagos—and similarly that those of Madagascar or Africa migrated in a similar manner to the Mascarenes. The origin and geographical distribution of species especially terrestrial is always of the highest interest to earnest students of life in its various phases. The history and origin of species, and their distribution, is perhaps one of the most difficult problems now engaging the minds of naturalists, and Günther refers to the reappearance of the "Indian, Mascarene, and Aldabra gigantic land-tortoises in the Galapagos," as one of these—not, he says, in "typical singularity, but with all the principal secondary modifications reproduced." The greater extension of this large Chelonian type at a former geological epoch seems manifest, when we find remains at Malta corresponding with those of the Galapagos tortoises, and the close affinity between the Galapagos and the Aldabra and Mascarene species, although separated by so vast a distance; we must grant a continuity of land over the region now covered by the Pacific, and which for ages has undergone, and is still undergoing depression. No one can doubt or fail to see the great changes that have taken place in the physical geography of South Africa, whose attenuation towards the south and eastern coasts is due to depression, thus causing the isolation of Madagascar, the Mascarene Islands, and the Seychelles, such severance and island making, through causes long-continued and not equally the same areally in equal times, has produced that specialised or peculiar fauna for which many of

these islands are noted, yet partaking largely of the Madagascar or parent types.

These gigantic land-tortoises which appear to have formerly occupied or inhabited the Mascarene Islands, are now only found at Aldabra, one of the Seychelles 1,000 miles further north. This isolation of Madagascar with its surrounding northern and eastern scattered islands and coral reefs alone indicate one continuous and extensive equatorial land. According to Wallace the Mascarene Islands were probably "earliest separated from Madagascar and before any carnivora had reached the country, hence the secure abode of groups of birds incapable of flight"; also to the same causes may be attributed in these islands the development of these gigantic land-tortoises, security, food, and time being three at least important factors for continuity of life; and surpassing as they did all others in size now living on the globe.

Dr. Günther formulates the races of tortoises indigenous to the Galapagos by the want of the nuchal plate, by the long neck and legs, and black shell, flatness of the crown of the skull, and thinness of the osseous carapace.

This diagnosis of the Galapagos races of tortoises shows them to be differentiated from the Aldabra races by the same structural characters as the Mascarene races—to which, however, they are closely allied—but differing in not possessing the double gular plate.

Dr. Günther in his elaborate notice of the extinct races of the Mascarene turtles, speaks of their being "sharply and structurally differentiated from the tortoises of the Aldabra group;" he has now ascertained through the possession of complete carapaces from Mauritius and Rodriguez, that there is an "absence of the suture which divides in most land-tortoises the gular plate of the sternum into two longitudinal halves." Again, he has proved that the Mascarene tortoises possess no nuchal plate. The solution of these structural differences of the races is due to recent researches and exploration in the Mauritius and Rodriguez, and they have resulted under Günther's determination in the three following deductions:—

1. That the specimens with a nuchal plate (and with double gulars) come from Aldabra.
2. That the specimens with simple gular (and without nuchal) come from the Mascarenes.
3. That the specimens without nuchal, and with double gular, are Galapagos tortoises.

Dr. Günther's researches conclusively show that the living gigantic tortoises of the Galapagos are more nearly allied or related to the extinct tortoises of the Mauritius, than those living in Aldabra. This generalisation of Dr. Günther's tends to show that there must have been several distinct groups and centres of *Testudo* ranging widely over the globe, and that some of each still survive in localities widely removed from each other; such being the Mascarene, Seychelles, and Galapagos, with remains found at Malta.

Elaborate osteological details accompany the descriptions of the species in the races of the Aldabra tortoises, the extinct races of the Mascarenes, and the Galapagos species. No less than fifty plates illustrate and accompany the letter-press to this learned memoir or monograph upon the gigantic land-tortoises (living and extinct) now in the collection of the British Museum. R. E.

OUR BOOK SHELF

Treatise on Modern Horology in Theory and Practice. By M. Claudius Saunier, Ex-Director of the School of Horology at Maçon, Chevalier of the Legion of Honour, Honorary Secretary to the Paris Society of Horologists, &c. Translated by Julien Trippin, Besançon, Watch Manufacturer, and Edward Rigg, M.A., Assayer in the Royal Mint. (London: J. Trippin.)

M. CLAUDIUS SAUNIER's treatise, though mainly intended for technical readers, contains a vast quantity of useful and instructive information, likely to be quite as interesting to amateur as to professional horologists. The work, moreover, is largely illustrated by beautiful coloured copperplate engravings, which, as models of accuracy and elegance, cannot be too highly praised. If in anything the book is perhaps scarcely up to the mark, as regards recent improvements in English clockwork; but no doubt such will be fully discussed in the appendix we understand M. Saunier has in hand, and which we hope will be published before the conclusion of the English series. So far as can be judged from the first number, the work of translation is being performed efficiently.

China. A History of the Laws, Manners, and Customs of the People. By John Henry Gray, M.A., LL.D., Archdeacon of Hongkong. Edited by W. G. Gregor. 2 vols. 140 illustrations. (London: Macmillan and Co., 1878.)

MANY books have been written on China and its puzzling people, and many attempts made to describe and account for the mode of life, the manners, and customs—to Europeans seemingly half-childish—of the latter. Hitherto, however, it is safe to say, the Chinese have not been understood. Their jealousy of foreigners, their unwillingness to admit the outside barbarian into the sanctity of their inner life is proverbial, so that the vaguest and most erroneous notions prevail concerning this remarkable people, combined with a sort of tacit conviction that their life in its various aspects is too trivial to be worth inquiring into. A perusal of Dr. Gray's work, we are sure, will greatly tend to dispel these mistaken notions. Dr. Gray evidently possesses an unusual power of winning his way into the friendship of all classes of Chinese, and this, combined with a liberal and tolerant mind and a faculty of careful observation, has enabled him to learn more about the everyday life and thoughts and motives of the people than almost any European has done before him. The work is certainly one of the most instructive that has ever been written on China, and every page is interesting. Family life in all its varied relationships is illustrated by pen and pencil, as is also official life, commercial life, professional or literary life, life in hotels, and life in the street, pawnshops, pagodas, agriculture, fortune-telling, religion, amusements; in short, it would be difficult to point out in what respect the book is defective. The illustrations are very interesting, and have mostly, we believe, been drawn by native artists. The work ought, we should think, to become a permanent standard work on China.

LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Arrangement of Museums

THE subject brought forward by Lord Wharncliffe a few days ago in the House of Lords forms part of a much larger